

REMARKS

Claims 1-3 and 8-9 stand rejected under 35 USC § 103(a) as being unpatentable over Husain, U.S. Patent No. 6,406,629, in view of either Chudoba, U.S. Patent No. 6,077,430 or Sato, JP 4-215892. Claims 4-7 stand rejected under 35 USC § 103(a) as being obvious over Husain in view of either Chudoba or Sato as applied to claims 1-3 and further in view of Daigger, U.S. Patent No. 6,517,723.

Claims 3-6 are cancelled by this amendment. Claims 1, 2 and 7-9, as amended, remain at issue. New claims 10-19 are submitted for examination.

Claim 1, as amended, is directed to a method for removal of biological nutrients from a wastewater yielding a low phosphorus output. The method includes providing a serial multistage bioreactor containing activated sludge comprising in hydraulic series an anaerobic zone, an upstream aerobic zone, a downstream aerobic zone and an immersed membrane filter operatively associated with the downstream aerobic zone, each zone having an upstream inlet and a downstream outlet and providing wastewater to the anaerobic zone inlet. A quantity of chemical to precipitate soluble and particulate phosphorous in an amount sufficient to yield a low phosphorous output is added downstream of the upstream aerobic zone and upstream of the immersed membrane filter. Treated water is separated from the activated sludge and precipitated phosphorous by the immersed membrane filter and return activated sludge separated by the immersed membrane filter from treated water is recycled to the anaerobic zone.

Rejection of Claim 1 as Obvious over Husain in View of Chudoba or Sato

As noted by the Examiner, Husain fails to disclose adding a quantity of chemical to precipitate soluble and particulate phosphorous to a downstream aerobic zone of an activated sludge reactor. Moreover, at column 2, lines 15-27, and column 3, lines 57-63, Husain actually teaches away from adding phosphorous precipitating chemicals to an activated sludge treatment processes including membrane filters. Husain expressly states that the invention described by Husain avoids the chemical precipitation of phosphates upstream of membrane filters. (col. 3, lines 57-59) Husain states that such systems require dosages of precipitating chemicals substantially in excess of the stoichiometric amount of phosphates in order to achieve low levels of phosphates in the effluent which results in excessive sludge generation and presence of metallic precipitates which increase the rate of fouling or force the operator to operate the system at an inefficient low sludge retention time. (col. 2, lines 22-26)

To avoid chemically precipitating phosphorous upstream of the membrane filters, Husain teaches that a side stream process operating parallel to a conventional multistage activated sludge biological treatment process should be used to remove by chemical precipitation excess phosphorous. (See col. 4, lines 2-13; col. 6, lines 31-67; col. 7, lines 1-67) Husain describes two different side stream processes for removing excess phosphorous by chemical precipitation. In the first side stream process, a liquid lean in solids but containing phosphates is extracted from an anaerobic mixed liquor obtained from an anaerobic stage of the activated sludge biological treatment process. (see col. 4, lines 2-7; col. 6, lines 54-67; col. 7, lines 1-5; Figure 4) Phosphates are precipitated from the liquid lean in solids but containing phosphates to produce a phosphorous lean liquid, which is either discharged as effluent or is returned to an anoxic or aerobic zone of the activated biological treatment sludge system. (see col. 4, lines 4-7; col. 7, lines 3-11, 19-25) In the second side stream process, an anaerobic mixed liquor is removed from an anaerobic stage of an activated biological treatment process to a reaction zone and treated to form a liquid rich in insoluble phosphates. (see col. 4, lines 7-9; col. 7, lines 52-64; Fig. 5) The liquid rich in insoluble phosphates is treated in a hydro-cyclone to separate out insoluble phosphates and create a liquid lean in insoluble phosphates. (see col. 4, lines 9-12; col. 7, lines 65-67; col. 8, lines 1-5; Fig. 5) The liquid lean in insoluble phosphates is returned to the anoxic zone. (see col. 4, lines 12-13; col. 8, lines 5-7) Thus, not only does Husain expressly teach away from combining precipitating chemicals with an activated sludge biological treatment process including a membrane filter, Husain teaches an alternative method of phosphorous removal which avoids addition of chemicals for precipitating phosphorous to the activated sludge biological treatment process.

Chudoba is directed to removing biological nutrients from a wastewater yielding a low phosphorous output and discloses adding chemicals to an aerobic zone 3 to enhance separation of phosphorous in wastewater by precipitation of phosphorous. However, Chudoba does not teach addition of precipitating chemicals to an activated sludge biological process using a membrane filter. Rather, Chudoba teaches a secondary clarifier for removing activated sludge and precipitated phosphorous from the effluent. In light of Husain's teaching away from the addition of phosphorous precipitating chemicals to an activated sludge process using a membrane filter, Applicant respectfully submits one skilled in the art would not be led by the teachings of Chudoba to modify the process of Husain to add phosphorous precipitating chemicals to the aerobic zone of Husain.

Sato similarly fails to provide any impetus to combine the addition of phosphorous precipitating chemicals to an activated sludge biological treatment process using membrane filters to separate the effluent. Submitted in an Information Disclosure Statement filed herewith is a translation of Sato. Sato does not teach an activated sludge biological treatment process. Rather, Sato teaches anaerobic filter beds wherein the organisms removing biological nutrients are fixed to a substrate within the first and second anaerobic zones. Thus, the treatment process of Sato has a much lower concentration of suspended material to be filtered by its membrane filter than an activated sludge process such as that recited in the pending claims and as disclosed in Husain and Chudoba. As a result, Sato also fails to provide an impetus to one skilled in the art to modify the teachings of Husain to provide for addition of phosphorous precipitants as part of an activated sludge treatment process. Moreover, Sato in no way overcomes Husain's teaching against such a combination of elements.

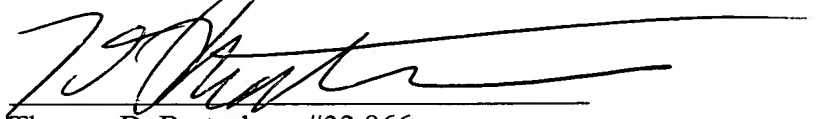
For the reasons discussed above, Applicant respectfully submits that claim 1, as amended, and claims 2 and 7-13, which are dependent from claim 1, are novel and non-obvious over Husain in view of either Chudoba or Sato.

Newly presented claim 14 is directed to an apparatus for removal of biological nutrients and includes in combination a serial multistage bioreactor containing activated sludge comprising in hydraulic series an anaerobic zone, an upstream aerobic zone and a downstream aerobic zone and an immersed membrane filter operatively associated with the downstream aerobic zone, with each zone having an upstream inlet and a downstream outlet. Means are provided for adding a quantity of chemical to precipitate soluble and particulate phosphorus in an amount sufficient to yield a low phosphorous output downstream of the upstream aerobic zone and upstream of the immersed membrane filter. Means are provided for recycling return activated sludge separated by the immersed membrane filter from treated water to the anaerobic zone. Applicant respectfully submits that the apparatus as recited in claim 14 is novel and non-obvious over Husain in combination with Chudoba, Sato or any other art of record, and therefore consideration and allowance of claim 14 and claims 15-17, which depend from claim 14, are respectfully requested.

For the reasons set forth above, Applicant respectfully submits the claims as amended are allowable over the art of record and reconsideration and issuance of a notice of allowance are respectfully requested. If it would be helpful to obtain favorable consideration of this case, the Examiner is encouraged to call and discuss this case with the undersigned.

This constitutes a request for any needed extension of time and an authorization to charge all fees therefore to deposit account No. 19-5117 if not otherwise specifically requested. The undersigned hereby authorizes the charge of any required fees not included or any deficiency of fees submitted herewith to be charged to deposit account No. 19-5117.

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'T. Bratschun', written over a horizontal line.

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